

China's Nuclear Energy Revolution

Pioneering Thorium and Fusion for a Sustainable Future

In April 2025, China achieved a historic milestone in clean energy by successfully refueling an operational thorium molten salt reactor (TMSR)—a world-first breakthrough signaling the dawn of commercially viable thorium-based nuclear power. This advancement positions China at the forefront of a global race to harness safer, cleaner, and more abundant energy sources.

Thorium: A Game-Changer for Nuclear Energy

Thorium, a safer and more plentiful alternative to uranium, offers transformative benefits: it cannot be weaponized, produces minimal long-lived radioactive waste, and boasts a global abundance. China's Bayan Obo mine alone holds sufficient thorium reserves to theoretically power the nation for 20,000 years. The experimental TMSR in the Gobi Desert, operational since 2023, generates 2 megawatts of thermal power and recently demonstrated sustained fuel reloading while running—a critical step toward scalability. By 2030, China aims to launch a 10-megawatt reactor capable of powering 10,000 homes annually. Additionally, state-owned firms are designing thorium-powered emission-free cargo ships, underscoring the technology's versatility.

Strategic Commitment and Innovation

China's thorium program, initiated in the 1970s, accelerated under the leadership of scientist Xu Hongjie. Overcoming engineering challenges—such as extreme-temperature materials and unprecedented reactor design—required a 400-strong research team and relentless dedication, including years of round-the-clock work in remote locations. Xu emphasized “strategic stamina,” highlighting China's decades-long focus on practical applications over theoretical pursuits.

Fusion: The Next Frontier

Parallel to thorium advancements, China leads in nuclear fusion research, aiming to replicate the sun's energy-generating process. Key projects include:

- **EAST (Experimental Advanced Superconducting Tokamak):** Dubbed China's “artificial sun,” it shattered records in 2025 by sustaining high-confinement plasma for 1,066 seconds—a leap toward continuous fusion reactions.
- **HL-2M Tokamak:** Achieved plasma temperatures exceeding 200 million°C, critical for efficient energy output.
- **Energy Singularity's HH70:** A private-sector innovation using high-temperature superconducting magnets to reduce tokamak size and cost, targeting a commercial demonstrator by 2030.

Global Implications

While U.S. molten salt reactor efforts lag, China's progress underscores its dominance in next-gen nuclear technology. These breakthroughs promise a future of near-limitless, carbon-free energy, potentially revolutionizing global energy security and climate resilience.

Conclusion

Amidst geopolitical distractions like trade wars, China's strides in thorium and fusion epitomize the transformative power of sustained technological investment. As the world grapples with energy and environmental crises, these innovations offer a roadmap to a sustainable, prosperous future—one where clean energy transcends political rivalries.

Source: Hua Bin, The Unz Review (Apr. 18, 2025)